Horizon of Islands

Across the shallow waters of Core Sound and Back Sound a low string of islands appears to float on the horizon, barely above the waves. Those islands, along with their soundside marshes and surrounding waters, are the park—Cape Lookout National Seashore—reachable only by boat.

Out on those barrier islands you quickly discover that the park's land is but a thin edge, much of it less than a few hundred yards wide. The experience there is dominated by what lies beyond: the wild Atlantic, with winds and longshore currents that constantly reshape the islands and the life that clings there.

CAPE LOOKOUT SHOALS

ATLANTIC OCEAN

Cape Lookout Lighthouse, a symbol of the enduring effort to guide ships through intense storms and shifting shoals, became operational in 1859.

CAPE LOOKOUT

Despite its dynamic nature, Cape Lookout has a long history of human settlement. There is much to explore, including the lighthouse Keepers' Quarters, historic Coast Guard Station, and the surviving structures of the Cape Village Historic District.

Shackleford Banks is a wider island, with dunes tall enough to shield a maritime forest where wild horses find shelter.

SHACKLEFORD BANKS

South Core Banks—one of Cape Lookout National Seashore's three barrier islands—stretches for 20 miles. From where you are standing you can see only about one-quarter of it.

SOUTH CORE BANKS

CORE SOUND

Core Sound is deceiving. Shallow and everchanging, it demands the right boat and an experienced pilot.

BACK SOUND

Back Sound's waters, protected by barrier islands, provide breeding grounds for a rich array of marine life.

You Are Here

Competing currents here at Shell Point are a small-scale version of the dramatic island-shaping forces that occur out at Cape Lookout.

IMAGE COURTESY OF GOOGLE EARTH

Distance to Shackleford Banks: 3 miles
Distance to Cape Lookout Lighthouse: 4.5 miles

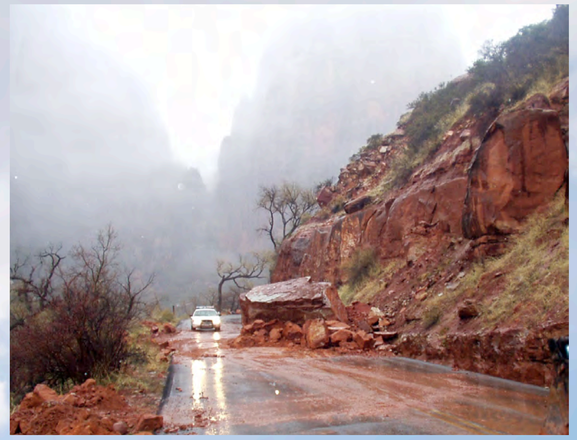
HARKERS ISLAND

Collapsing Scenery

The cliffs appear solid and motionless. But the visible scars tell a different story. In July 1983 a huge slab broke off the the opposite cliff, leaving a buff-colored scar and tons of rubble at the base. The entire event was over in moments.

These canyons are not permanent scenery. Many rockfalls shaped the dynamic and evolving canyons. Dramatic facelifts like the 1983 rockfall are relatively rare, but frequent small piles of rocks on the roadway reveal this terrain's volatile personality. Look for other rockfall scars throughout the park.

Truck demolished by rockfall in Oak Creek Canyon, 1947. The rock weighed an estimated 880 tons.



Rockfall along a park road, 2004.

1983 rockfall site

National Park Service
U.S. Department of the Interior

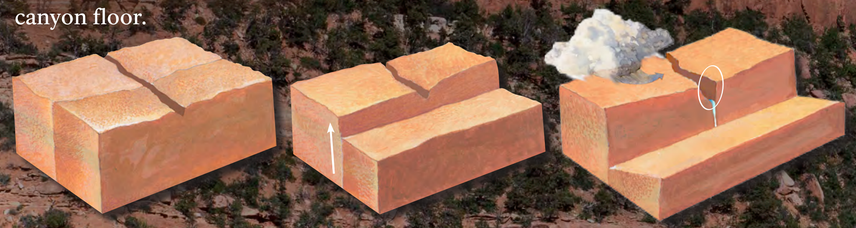
Find the Hanging Valley

The tracks give it away. Dark mineral stains on the opposite wall indicate an occasional waterfall that pours over the cliff after heavy storms. Waterfall tracks can also indicate that a hanging valley lies above them.

You can see this pattern throughout Kolob Canyons and in Zion Canyon. Look for the telltale tracks of a high waterfall that mark the lip of a hanging valley.

Originally the upper, side canyon's stream was a tributary connected to the main canyon's stream. Uplift along the main canyon wall separated the side canyon. In time the side canyon was marooned, hanging a thousand feet above the main canyon floor.

Waterfalls are spectacular but short-lived in this dry land. Some last only minutes. Dissolved desert minerals in the water leave dark streaks of reddish iron and purple manganese on cliffs when the water evaporates.

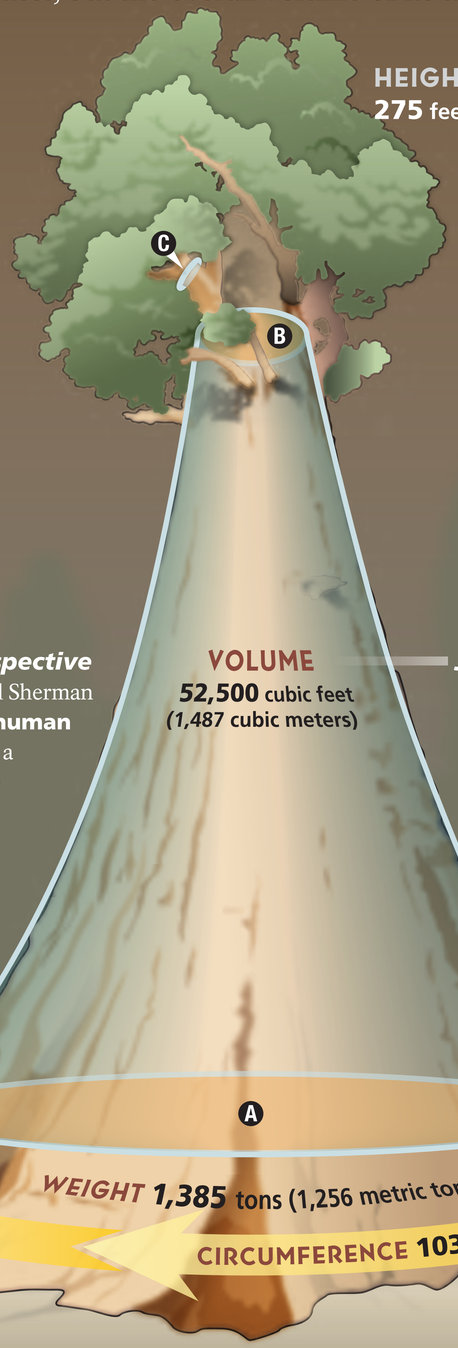


The General Sherman Tree

This tree is not the tallest or the widest, but the overall volume of its trunk makes it the biggest tree on Earth.

SEQUOIA WORLD RECORDS

	Volume	Weight	Width	Height	Age
General Sherman	✕	✕			
General Grant			✕		
unnamed sequoias				✕	✕
	52,500 cubic feet (1,487 cubic meters)	1,385 tons (1,256 metric tons)	40 feet (12 meters)	311 feet (95 meters)	3,200 years



BIGGEST DOES NOT MEAN OLDEST

The General Sherman Tree is about 1,000 years younger than the oldest-known sequoia. How can this be?

Location, location, location! Where growing conditions are best, sequoias grow faster. They outgrow older trees rooted in less prime locations.

The life-sized photograph below shows the cross section of a sequoia that hung on to life in a poor location—for 100 years! Clearly, the Sherman Tree grows in an ideal spot.

STUNTED 100-YEAR OLD SEQUOIA

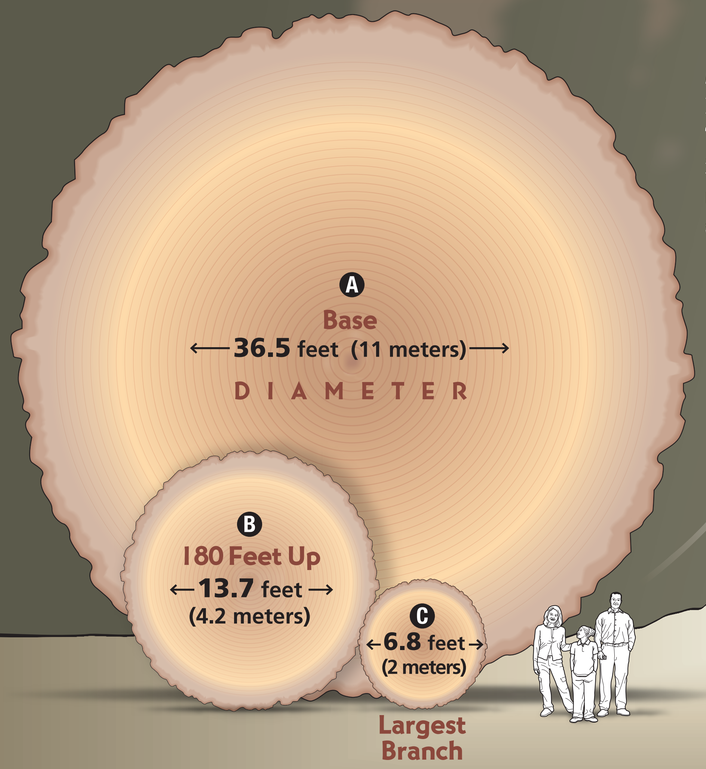
actual size, cross-section smaller than a U.S. half dollar

It's a Matter of Perspective

Looking up at the General Sherman Tree for a **six-foot-tall human** is about the equivalent of a **mouse** looking up at the six-foot-tall human.

Just How Much Is That?

If the Sherman Tree's trunk could be filled with **water** it would provide enough water for **9,844 baths**. That's one bath every day for **27 years**.



FRASER GLACIER
covered San Juan Island with mile-high ice.

Mount Finlayson, a glacial moraine, was built from rock, sand, and clay deposited by the glacier.

When the glacier began to melt a tremendous weight was removed,
and the land began to rise back to its former elevation.

As the land rose, new shorelines formed
and created the terraced hillside you see today.

The glacially shaped topography offered a strategic location for the U.S. Army to build a redoubt for protection against British warships. Glacial boulders—like those lying in the prairie today—made excellent fill for the redoubt's construction, creating a sturdy foundation to mount artillery.

Glacial erratic

Glacial erratic

Glacial erratic

Ice Land

You don't need to look hard to find evidence of past glaciers here. The large boulders—called erratics—scattered in the prairie were plucked from mountains 200 to 300 miles to the north. A glacier carried the rocks here and set them down as it melted. This all happened 18,200 to 13,300 years ago, when a glacier nearly a mile high lay where you now stand. The weight of the glacier was enormous it pushed down the land.

But when the glacier melted, the sea level rose and the land began to rebound. The rising land eventually outstripped rising sea levels. Mount Finlayson's terraced appearance is evidence of this. Beginning at the top of the mountain, each terrace step you see is an ancient shoreline. Each time the land rose above sea level a new shoreline would form.

Weather-Maker

Towering above the surrounding terrain like an island in the clouds, Mount Rainier creates its own weather. A cloud on the summit may appear harmless from this perspective, but it is probably lashing climbers with an intense, localized blizzard. At other times the pattern may be reversed: halfway up the mountain, climbers may be emerging from dense mist into a glittering world of sunlit ice.

If the mountain is temporarily hidden from this overlook, then you have simply become part of its stormy dynamics. Mount Rainier not only creates its own world of weather, but dictates the habitats around it: the dripping moss of Carbon River rainforest, the massive glaciers, and the rain-shadow that leaves the Sunrise area to the east much drier than the rest of the park.

This close to Puget Sound and the Pacific, Mount Rainier is a magnet for moisture-laden storm fronts. With its huge mass and elevation, the mountain forces the air to rise steeply. As it rises, it cools and precipitates heavily, often in record-breaking snowfalls on the slopes around Paradise.

The weather on Rainier can reach a severity equal to that of the highest mountain in the world…

Jim Whittaker, former Rainier guide and first American to climb Mount Everest

National Park Service
U.S. Department of the Interior

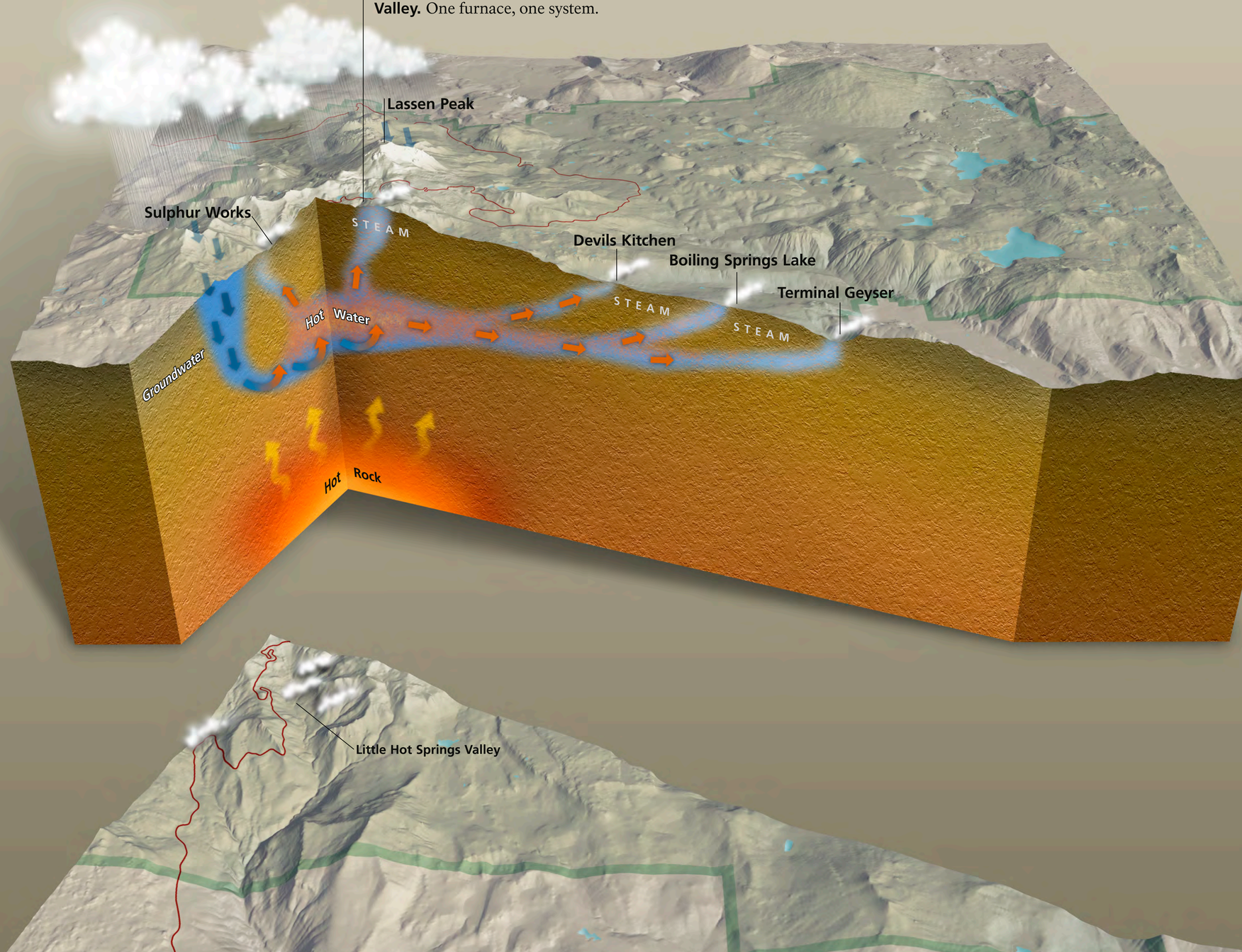
One Furnace, One System

Molten rock—magma—lies miles below your feet. The magma that is chambered there is the same that fed the eruptions of Lassen Peak and other dacite-dome volcanoes like Bumpass Mountain. The magma superheats a reservoir of groundwater deep within the Earth. Steam, as hot as 464°F (240°C), rises and condenses into water again, mixing with percolating groundwater nearer the surface. The mixture produces sulfate water that escapes through park hydrothermal features at temperatures about 200°F (93°C).

CAUTION: Stay on boardwalks and trails. People are severely burned each year when they ignore this caution. Dangerous boiling water and steam may be at or near the surface.

Bumpass Hell

Bumpass Hell is the largest "escape valve" for the underground boiler or hydrothermal system and is the main upward vent. Lesser upward flow emits at **Sulphur Works**, **Devils Kitchen**, **Boiling Springs Lake**, and **Little Hot Springs Valley.** One furnace, one system.



Living Laboratory

Glaciers are sensitive to climate change. Exit Glacier has been retreating since the end of the Little Ice Age. The glacier's retreat, shown below, tells only part of the story. Scientists also measure annual snow accumulation and melting to get a better indication of the glacier's "health."

Scientific monitoring and research at Kenai Fjords contributes to our understanding of Earth's changing climate and gives us clues as to what the future may hold.

Little Ice Age maximum

1815

1889

1894

1899

1914

1917

1926

1951

1961

1997

2007

These lines identify moraines marking the glacier's extent in these years.

Exit Glacier

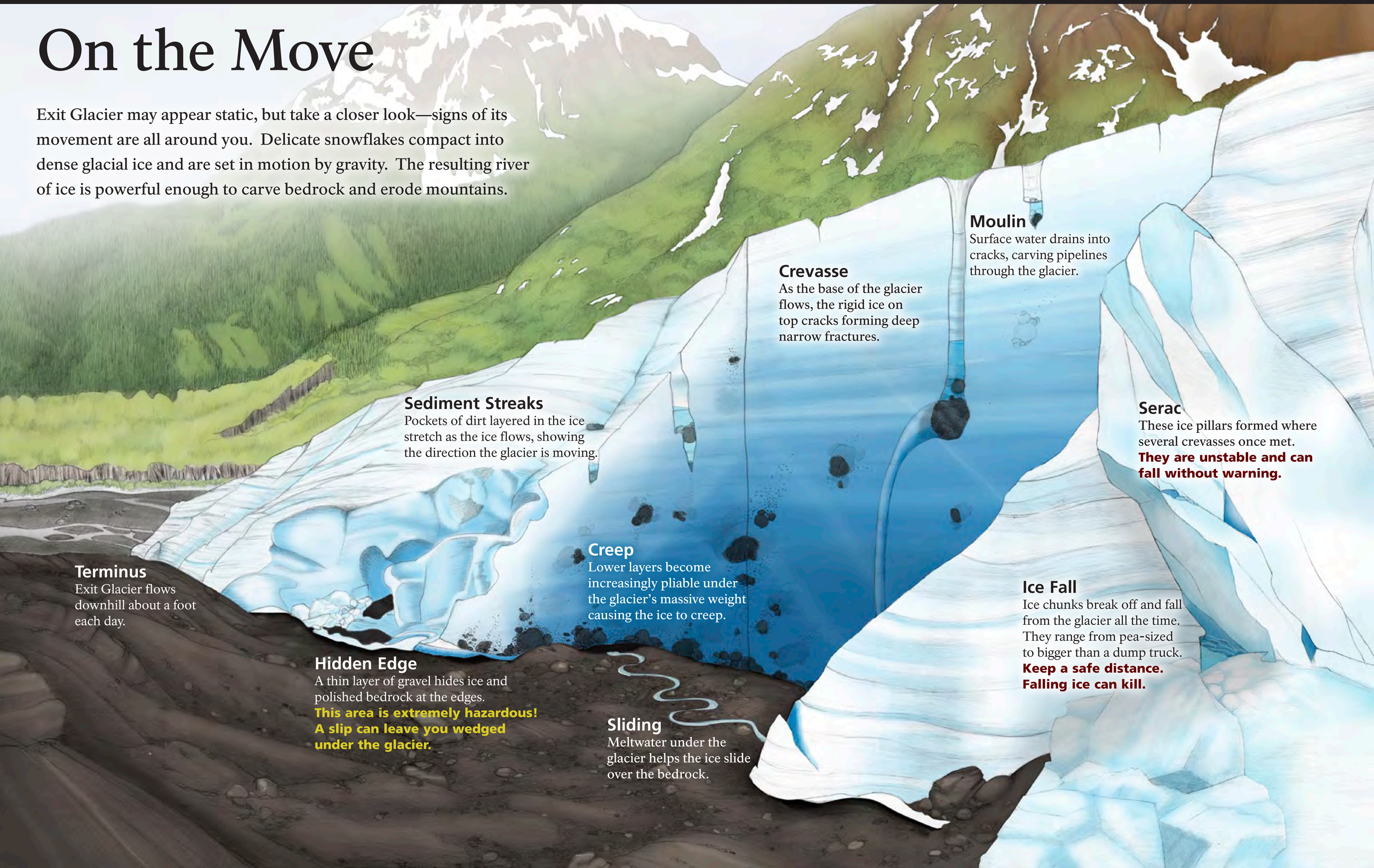
In 2001, scientists completed a study to date Exit Glacier's retreat by comparing vegetation on glacial moraines and studying historic aerial photographs.

Today satellite images are used to monitor changes in the glacier's margins. The "year" signs along the road and trails mark these points.

National Park Service
U.S. Department of the Interior

On the Move

Exit Glacier may appear static, but take a closer look—signs of its movement are all around you. Delicate snowflakes compact into dense glacial ice and are set in motion by gravity. The resulting river of ice is powerful enough to carve bedrock and erode mountains.



Moulin
Surface water drains into cracks, carving pipelines through the glacier.

Crevasse
As the base of the glacier flows, the rigid ice on top cracks forming deep narrow fractures.

Sediment Streaks
Pockets of dirt layered in the ice stretch as the ice flows, showing the direction the glacier is moving.

Serac
These ice pillars formed where several crevasses once met.
They are unstable and can fall without warning.

Terminus
Exit Glacier flows downhill about a foot each day.

Creep
Lower layers become increasingly pliable under the glacier's massive weight causing the ice to creep.

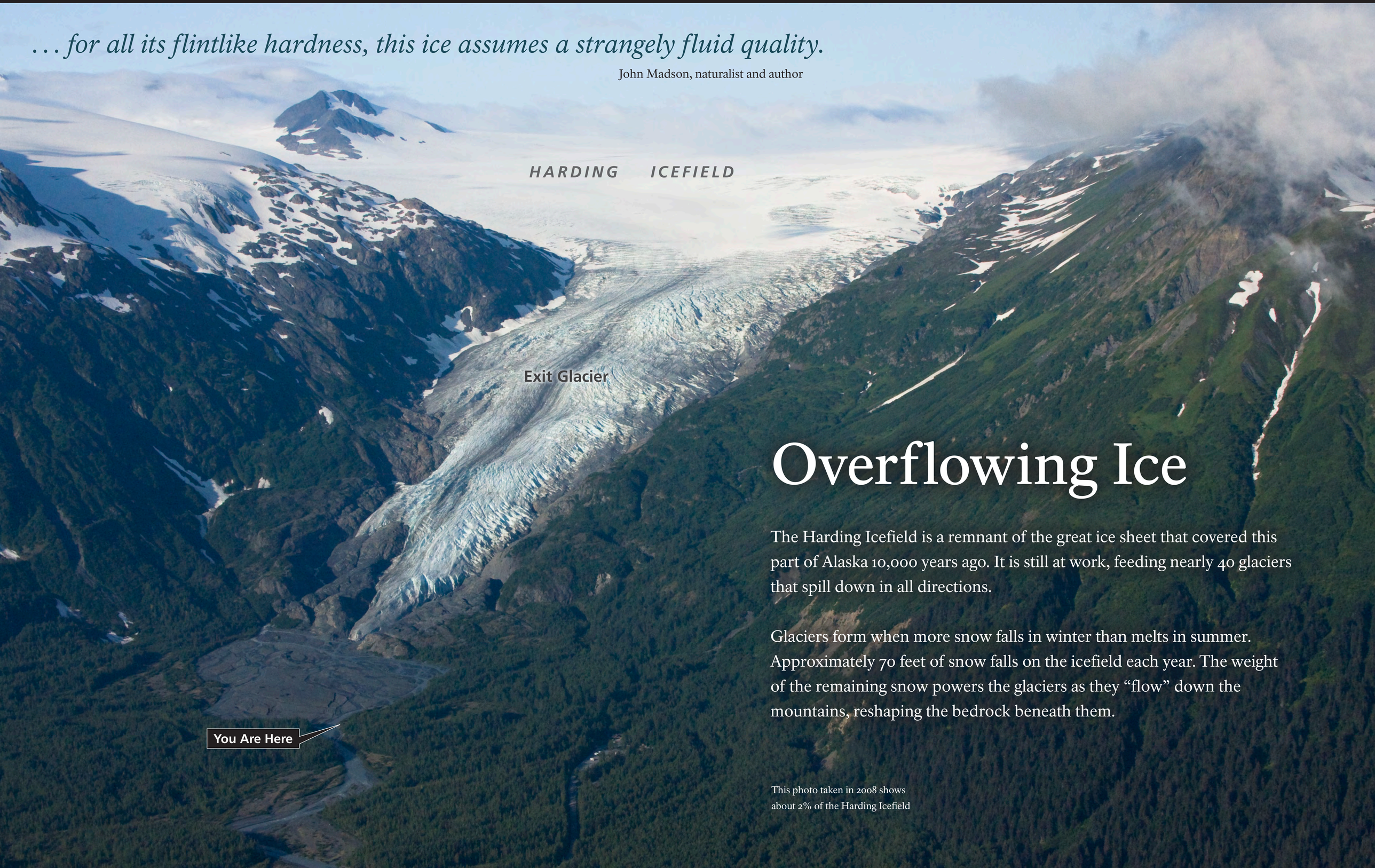
Ice Fall
Ice chunks break off and fall from the glacier all the time. They range from pea-sized to bigger than a dump truck.
Keep a safe distance. Falling ice can kill.

Hidden Edge
A thin layer of gravel hides ice and polished bedrock at the edges.
This area is extremely hazardous! A slip can leave you wedged under the glacier.

Sliding
Meltwater under the glacier helps the ice slide over the bedrock.

. . . for all its flintlike hardness, this ice assumes a strangely fluid quality.

John Madson, naturalist and author



Overflowing Ice

The Harding Icefield is a remnant of the great ice sheet that covered this part of Alaska 10,000 years ago. It is still at work, feeding nearly 40 glaciers that spill down in all directions.

Glaciers form when more snow falls in winter than melts in summer. Approximately 70 feet of snow falls on the icefield each year. The weight of the remaining snow powers the glaciers as they “flow” down the mountains, reshaping the bedrock beneath them.

This photo taken in 2008 shows
about 2% of the Harding Icefield

National Park Service
U.S. Department of the Interior

Choice Spots

Local folklore holds that in the 1920s an enterprising poultry farmer believed a turkey farm would work nicely here—thus the name Turkey Flats. Lack of water and distance from markets, however, proved otherwise. Three habitats—desert scrub, sand dune, and mountain—are distinctive here. Each supports specialized animals that find it hard or impossible to survive elsewhere.

DESERT SCRUB

The deep soils found here make for easy burrow excavation by desert tortoises. The dens are often dug under the shade and protection of creosote bushes.

The sidewinder rattlesnake is an ambush predator that hides under bushes or buries itself in sand to await passing prey. Sidewinders are known for their distinctive sideways locomotion that leaves parallel J-shaped tracks in the sand.

SAND DUNE

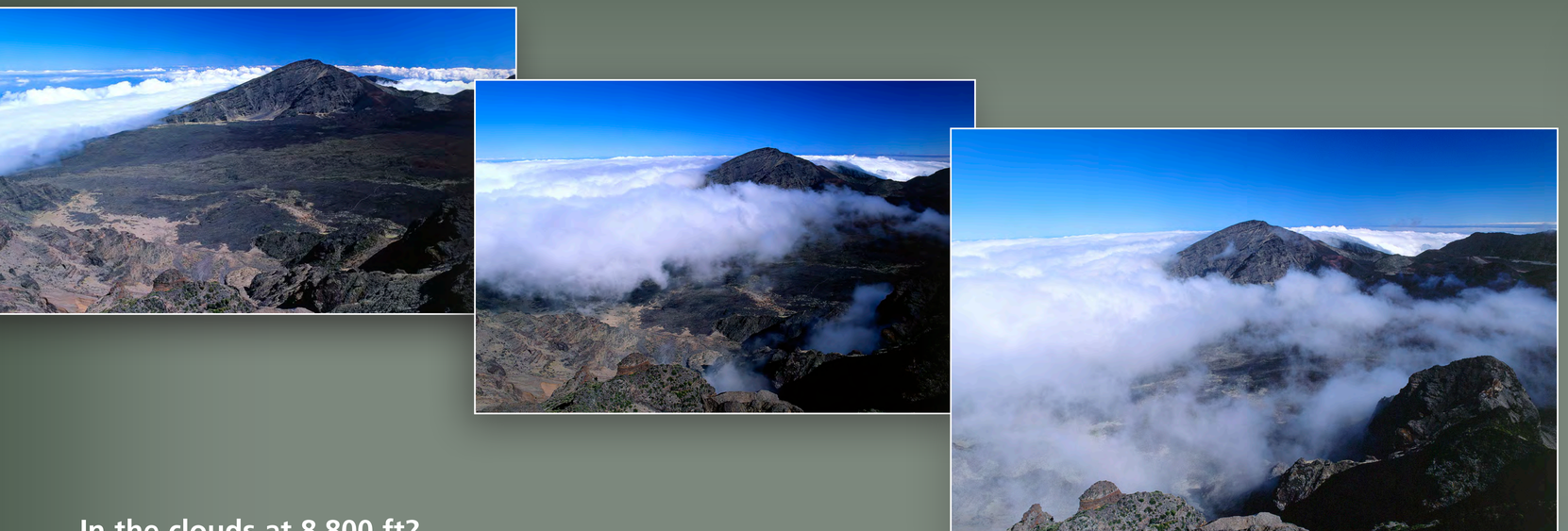
Mojave fringe-toed lizards of Joshua Tree live only in the sandy areas found here and at Pinto Wells. The lizard's fringes are scales on its hind toes that enable it to run quickly over shifting sands.

The desert kangaroo rat is well suited to its sand dune home. It has many adaptations to conserve water and extracts all its required moisture from seeds.

MOUNTAIN

The collared lizard lives in the rocky, open places of Pinto Mountain. The rocks provide shelter, basking places, and lookout posts to spy prey.

The rock wren, though widespread throughout most of the park, favors rocky desert slopes and hillsides. The drab-colored bird feeds exclusively on insects and is commonly seen on Pinto Mountain singing loudly from rock tops.



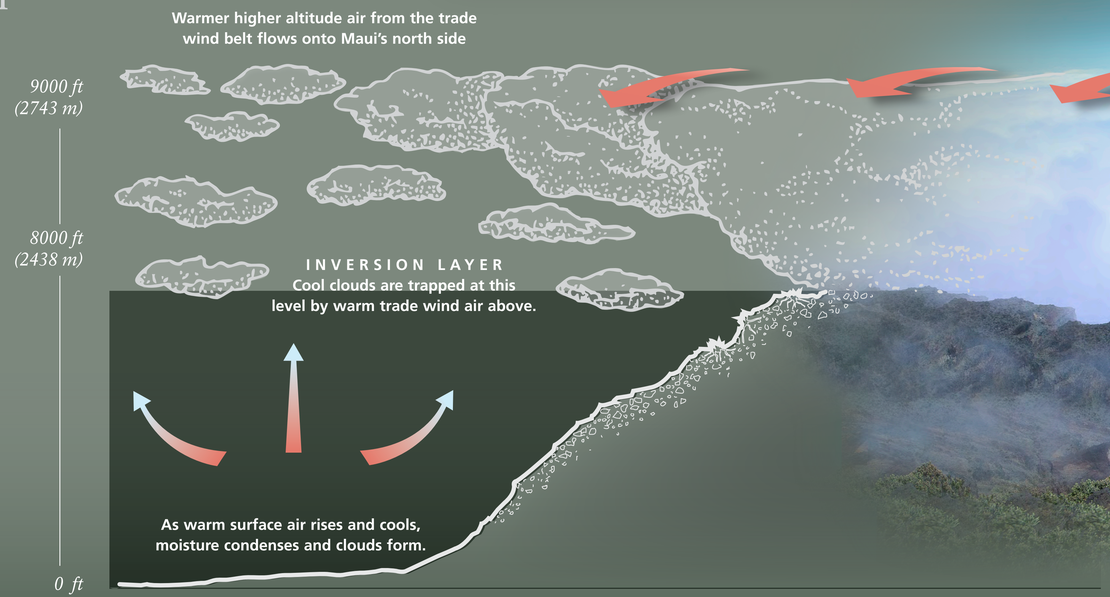
Instant Weather

In just a few minutes the conditions here near the summit of Haleakalā can shift from summer to winter. You can feel the difference, and from this overlook you can watch the weather forming at your feet. In this wind-driven world, clouds flow daily into the summit basin, causing sudden drops in temperature.

In the clouds at 8,800 ft?

The Trade Wind Inversion

The trade wind inversion traps clouds in the basin, preventing them from rising over the mountain. This keeps the summit dry and desert-like. Most precipitation falls on the northeast side of the island (*to your left*), the south side (*to your right*) stays sunny.



This series of four photos was taken over a 5-minute period, showing how quickly clouds form and change the weather.

National Park Service
U.S. Department of the Interior

Florissantia speirii

Preserved remains of a delicate flower part called a calyx. The fossil was an extinct genus of the cocoa family.

Courtesy of University of California Museum of Paleontology

Lycosa florissanti

This wolf spider, like its modern relatives, hunted its prey on the ground. It most likely lived on the forest floor, under rocks and plants.

Courtesy of Department of Invertebrate Paleontology, American Museum of Natural History

To find fossils, scientists must carefully split the shale open

Hidden Treasures in the Shale

The shale outcrop exposed in the hillside in front of you contains thousands of tiny, fragile fossils of insects and leaves. The fossils are hidden between layers of light gray rock called shale. The shale was formed at the bottom of an ancient lake that once existed in the place where you now stand. Plants and animals that died in or near the ancient lake settled to bottom where they were buried in layers of clay and ash. Eventually, the layers hardened into rock and the plants and animals became fossilized.

Deep Gorge–Big Waterfall

Enormous quantities of water released from melting glaciers carved this gorge in less than 500 years. Almost all of New York had been covered by a mile-thick layer of ice. As the climate warmed and the ice front retreated, large pools of meltwater collected in lowland areas. Thirteen thousand years ago Glacial Lake Iroquois covered the basin now occupied by Lake Ontario, and the only path for water to drain from the Great Lakes to the sea was through the Mohawk Valley. The glacial Iro-Mohawk River carried over 100 times the flow of today's river—a torrent that quickly wore through soft shale, forming the deep gorge in front of you.

North

0 40 Kilometers
0 40 Miles

ICE SHEET
13,000 years ago

St. Lawrence River

GLACIAL LAKE IROQUOIS

present Lake Ontario shoreline

ADIRONDACK MOUNTAINS

Glacial Lake Coveville

Little Falls

Iro-Mohawk River

Mohawk Valley

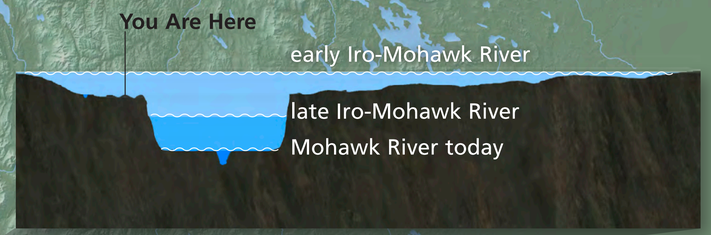
Cohoes Falls

You Are Here

Hudson River

New York State today

Shifting drainage patterns
Flows through the Mohawk Valley dropped dramatically once the ice retreated north of the Adirondack Mountains, allowing Lake Iroquois and the upper Great Lakes to drain through the Champlain and Hudson Valleys and later through the St. Lawrence Valley.



Mohawk Gorge below Cohoes Falls
The early Iro-Mohawk covered a wide area, and the river's surface would have been several feet above your head. Meltwater soon eroded a slot in the rock that captured all of the flow. Today's wildest floods fill only a small portion of the gorge carved by the Mohawk River's mighty ice-age predecessor.

Birth of a Dune

Sea oats: their extensive root system stabilizes the dunes.

Notice the young dunes in front of you. The surf has deposited sand on the beach, and the incessant wind has formed the sand into dunes. Why doesn't the sand bury the rest of the island or just blow away altogether? It might, but plants hold these dunes in place.

Dunes stabilized by plants form a protective barrier for the rest of the island. More-sensitive plants and trees could not grow on this island without these dunes. Just as barrier islands protect the coastal mainland, sand dunes protect the barrier island.

Sea oats are a hardy grass that grows well in infertile, salty sand. They quickly develop a vast root system that keeps the sand from blowing away.

Their tall, leafy tops shelter the area around them, which causes blowing sand to accumulate and prevents it from blowing away. When buried after a storm, sea oats quickly grow through the sand, developing more roots and stems to stabilize the new sand.

Over time the stabilized dunes grow larger, creating a wall of protection for the rest of the island. Because they are protected from the ocean's salty spray, more-sensitive plants are able to grow behind the dunes.

Sea oats are very sensitive to vehicle and foot traffic. If the plants are damaged or destroyed, the dune can blow or wash away.

Notice how the sand is higher and finer where these grasses grow. Which came first, the mound of sand or the grass?